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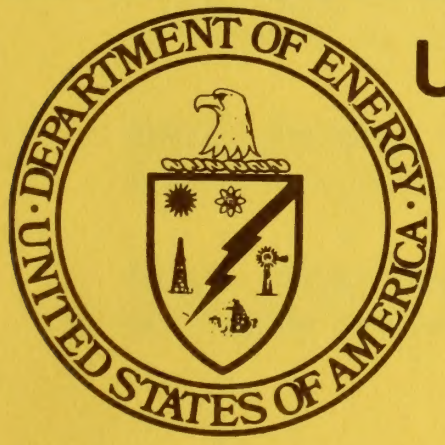
Monthly Performance Report

HOMES BY MARILYNN

MAY 1979



U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT

HOMES BY MARILYNN

MAY 1979

I. SYSTEM DESCRIPTION

The Homes by Marilynn site is a single-family residence in Albuquerque, New Mexico. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 335 square feet. The array faces south at an angle of 55 degrees to the horizontal. A mixture of 35 percent ethylene glycol and 65 percent water is the transfer medium that delivers solar energy from the collector array to a liquid-to-liquid heat exchanger in the storage loop. It also delivers solar energy to a liquid-to-air heat exchanger in the space heating subsystem in order to preheat outside air for the heat pump. Solar energy is stored underground in a 1000-gallon water storage tank. The city supply water is preheated by continuously circulating water from a preheat tank through a heat exchanger in the storage tank. Preheated city water is stored in a 30-gallon preheat storage tank and supplied, on demand, to a conventional 40-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a heat pump and an electrical heating element in the air-handling unit provide auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for water heating. The system, shown schematically in Figure 1, has five modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the temperature at the top of the collector is 10°F higher than the temperature in storage.

Mode 2 - Storage-to-Space Heating: This mode activates when there is a demand for space heating and the storage temperature is higher than 85°F.

Mode 3 - Storage-to-DHW Tank: This mode is active at all times with water continuously circulating between the DHW preheat tank and the storage tank.

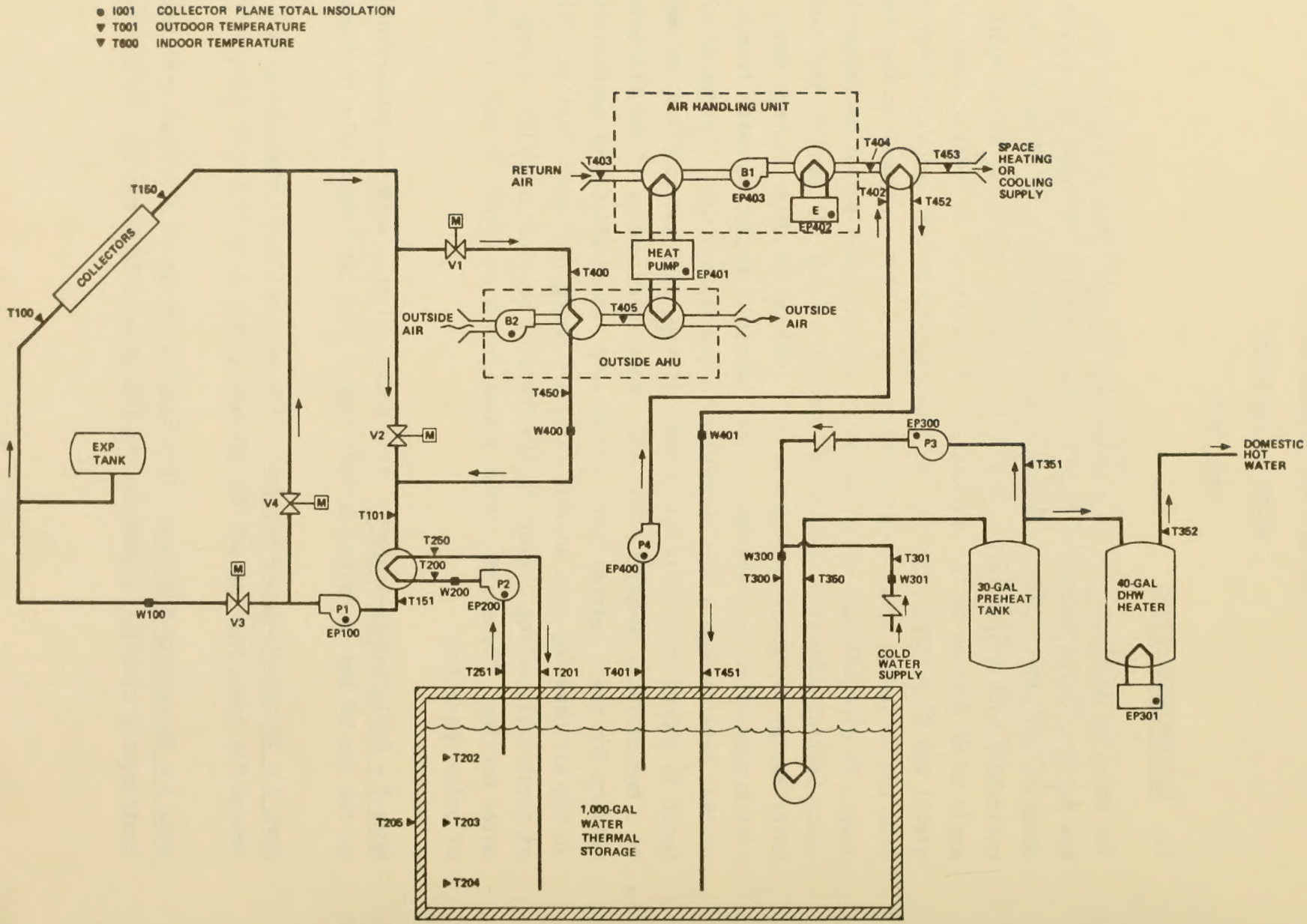

Figure 1. HOMES BY MARILYNN SOLAR ENERGY SYSTEM SCHEMATIC

Mode 4 - Collector-to-Storage and Heat Pump Assist: This mode activates when the conditions for mode 1 are satisfied, there is a demand for heat pump assistance for space heating, and the temperature of storage is higher than 135°F. During this mode, the outside air that is transferred across the heat pump coil is preheated.

Mode 5 - Storage-to-Preheat Assist: This mode activates when there is no flow through the collector, the temperature of storage is higher than 135°F, and a demand for heat pump assistance for space heating exists. The collector loop heat exchanger obtains energy from storage to preheat the outside air that is transferred across the heat pump coil.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied in May and the solar energy system operated continuously during the month. Total solar energy collected was 2.4 million Btu and the amount of solar energy used was 1.3 million Btu or 54 percent of the collected energy. The change in stored energy was 0.014 million Btu and the total system losses amounted to 1.1 million Btu. Solar energy satisfied 66 percent of the DHW requirements and 64 percent of the space heating requirements. The solar energy system provided an electrical energy savings of 0.25 million Btu.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 14.7 million Btu for a daily average of 1534 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during May of 1856 Btu per square foot for a south-facing plane with a tilt

of 55 degrees to the horizontal. The average ambient temperature during May was 63°F as compared with the long-term average for May of 65°F. The number of heating degree-days for the month (based on a 65°F reference) was 115, as compared with the long-term average of 58. The number of cooling degree-days was 51, as compared with the long-term average of 67.

The ambient temperature sensor (T001) provided erroneous values intermittently during the month. The affect on the average temperature reading appears to be negligible: the average ambient temperature measured at another solar installation in this geographical area was also 63°F.

THERMAL PERFORMANCE

System - During May the solar energy system performed somewhat poorer than expected. The expected performance was determined from a modified f-chart analysis using measured weather and subsystem loads as input. Solar energy used by the system was estimated by assuming that all energy collected would be applied to the load. Actual solar energy used was 1.3 million Btu versus an estimated 2.0 million Btu. System total solar fraction was 66 percent versus an estimated 100 percent.

Collector - The total incident solar radiation on the collector array for the month of May was 14.7 million Btu. During the period the collector loop was operating, the total insolation amounted to 8.0 million Btu. The total collected solar energy for the month of May was 2.4 million Btu, resulting in a collector array efficiency of 16 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 2.7 million Btu.

The apparent 0.3 million Btu gain in solar energy delivered to storage over the amount collected is an obvious impossibility. The flow rates measured by sensors W100 and W200 should remain constant throughout a period of continuous collection. The source of this variation has not been determined. However,

potential sources are: an erroneous measurement capability through the flow sensors, actual flow variance caused by the collector pump, and/or inconsistent operation of valves V1 and V2. At the end of April a very high (50 to 60 percent) flow rate variation had been observed. This condition continued to deteriorate until May 7 when flow became totally unmeasurable. On May 9, after fluid was added to the collector loop, the variation decreased to 15 to 20 percent, which was the condition prior to the sudden deterioration.

Storage - Solar energy delivered to storage was 2.7 million Btu. There were 1.3 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 1.4 million Btu. This loss represented 52 percent of the energy delivered to storage. The storage efficiency was 48 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 130°F.

DHW Load - The DHW subsystem consumed 1.2 million Btu of solar energy and 0.51 million Btu of auxiliary electrical energy to satisfy a hot water load of 1.4 million Btu. The solar fraction of this load was 66 percent. Losses from the DHW subsystem were 0.39 million Btu. The DHW subsystem consumed a total of 0.24 million Btu of operating energy, resulting in an electrical energy savings of 0.74 million Btu. A daily average of 92 gallons of DHW was consumed at an average temperature of 127°F delivered from the tank.

Space Heating Load - Space heating was necessary on only 4 days during May with a total requirement of 0.21 million Btu. The solar energy system provided 0.14 million Btu or 64 percent of this requirement. The remaining load of 0.074 million Btu was satisfied by an auxiliary electrical heat pump at an electrical expense of 0.029 million Btu. The space heating subsystem consumed an additional 0.024 million Btu of operating energy. A net electrical energy savings of 0.063 million Btu was obtained by the solar portion of the space heating subsystem.

OBSERVATIONS

Two factors limited the total effectiveness of the solar system this month. The collector loop functioned poorly until fluid was added to the system on May 9. The energy available in storage had been reduced and it was not sufficient to satisfy the space heating requirement on May 9, 10, and 11. The second factor was caused by the combination of large hot water utilization in conjunction with a relatively small (30 gallon) DHW preheat tank. Electrical energy is frequently required to heat the water in the DHW tank to satisfy the thermostat setting. The replenishment water from the preheat tank has not always had sufficient time to be heated from solar energy prior to the next hot water demand.

The space heating subsystem is designed to utilize solar energy as long as the storage temperature is higher than 85°F. Measurements of storage indicate that the use of solar energy for space heating terminates when the storage temperature decreases to 105°F. The constantly cycling DHW preheat loop continues to extract energy from storage as long as there is a demand in the DHW preheat tank. Storage must then be reheated to 105°F in order to replace the storage losses and the energy used by the DHW preheat. Then solar energy space heating can be accomplished.

In order to heat the house, mode 4 and mode 5 require the use of the heat pump and a storage temperature of at least 135°F. The heat pump is only used to heat the house upon a second-stage thermostat heating requirement (house temperature is "n" degrees less than the thermostat setting). The only time that these criteria can be met is when mode 2 is not functioning. Since the valves and flow rate in the collector loop are potential sources of the imbalance in energy calculations, elimination of the heat pump assist functions may be worth considering.

ENERGY SAVINGS

The solar energy system provided a net electrical energy savings of 0.25 million Btu. The DHW subsystem provided an electrical energy savings of

0.74 million Btu and the space heating subsystem provided an electrical energy savings of 0.063 million Btu. The collection and storage subsystem incurred an electrical energy expense of 0.55 million Btu.

III. ACTION STATUS

Flow rate variance through the collector flow rate sensor (W100) is affecting the energy collection calculation. An investigation is continuing to determine whether the measurement sensor or an erratic flow is the cause. A test run on May 9 to utilize the heat pump assist mode to compare flows through W100 and W400 was inconclusive. Although expected to be identical, the flow rate through W400 measured one third the flow rate through W100.

Boeing is planning to replace the temperature sensor (T100) that measures the outside ambient temperature.

On May 4, the grantee replaced the burnt out heating element in the DHW loop.

The grantee is evaluating whether the deactivation of the solar portion of the space heating subsystem is acceptable at a 105°F storage temperature or whether it should be corrected to operate in the 85°F design level.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY,1979

SOLAR/1008-79/05

SITE/SYSTEM DESCRIPTION:
HOMES BY MARILYN IS A SINGLE FAMILY DWELLING. THE HEAT PUMP IS ASSISTED BY SOLAR ENERGY DURING THE HEATING CYCLE. NO SOLAR ENERGY IS USED IN ASSISTING THE COOLING CYCLE OF THE HEAT PUMP. HOWEVER, A DOMESTIC HOT WATER LOAD IS REQUIRED YEAR-ROUND.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	14.738	MILLION BTU
	47542	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	2.402	MILLION BTU
	7749	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	63	DEGREES F
AVERAGE BUILDING TEMPERATURE	77	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.09	
ECSS OPERATING ENERGY	0.550	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.808	MILLION BTU
TOTAL ENERGY CONSUMED	3.807	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	1.348	0.212	N.A.	1.560 MILLION BTU
SOLAR FRACTION	66	64	N.A.	66 PERCENT
SOLAR ENERGY USED	1.174	0.136	N.A.	1.311 MILLION BTU
OPERATING ENERGY	0.235	0.024	N.A.	0.808 MILLION BTU
AUX. THERMAL ENERGY	0.567	0.021	N.A.	0.588 MILLION BTU
AUX. ELECTRIC FUEL	0.567	0.029	N.A.	0.596 MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. MILLION BTU
ELECTRICAL SAVINGS	0.740	0.063	N.A.	0.253 MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.334

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY,1979

SOLAR/1008-79/05

SITE/SYSTEM DESCRIPTION:
HOMES BY MARILYN IS A SINGLE FAMILY DWELLING. THE HEAT PUMP IS ASSISTED BY SOLAR ENERGY DURING THE HEATING CYCLE. NO SOLAR ENERGY IS USED IN ASSISTING THE COOLING CYCLE OF THE HEAT PUMP. HOWEVER, A DOMESTIC HOT WATER LOAD IS REQUIRED YEAR-ROUND.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	15.549 GIGA JOULES
	539886 KJ/SQ.M.
COLLECTED SOLAR ENERGY	2.534 GIGA JOULES
	87998 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	17 DEGREES C
AVERAGE BUILDING TEMPERATURE	25 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.09
ECSS OPERATING ENERGY	0.580 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.853 GIGA JOULES
TOTAL ENERGY CONSUMED	4.016 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	1.422	0.224	N.A.	1.646 GIGA JOULES
SOLAR FRACTION	66	64	N.A.	66 PERCENT
SOLAR ENERGY USED	1.239	0.144	N.A.	1.383 GIGA JOULES
OPERATING ENERGY	0.248	0.025	N.A.	0.853 GIGA JOULES
AUX. THERMAL ENG	0.598	0.022	N.A.	0.620 GIGA JOULES
AUX. ELECTRIC FUEL	0.598	0.031	N.A.	0.629 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	0.781	0.066	N.A.	0.267 GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.334

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY,1979

SOLAR/1008-79/05

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.454	63	0.058	N	0.005	N	0.128
2	0.491	61	0.050	O	0.007	O	0.102
3	0.347	53	0.050	T	0.002	T	0.146
4	0.586	60	0.041		0.009		0.069
5	0.496	64	0.018	A	0.010	A	0.036
6	0.627	72	0.022	P	0.011	P	0.035
7	0.607	69	0.020	P	0.013	P	0.033
8	0.525	62	0.021	L	0.008	L	0.040
9	0.297	47	0.045	I	0.019	I	0.151
10	0.480	50	0.063	C	0.020	C	0.131
11	0.556	52	0.053	A	0.033	A	0.095
12	0.608	58	0.050	B	0.030	B	0.083
13	0.600	60	0.027	L	0.025	L	0.045
14	0.597	65	0.053	E	0.028	E	0.089
15	0.336	62	0.030		0.017		0.088
16	0.458	66	0.033		0.019		0.072
17	0.461	67	0.050		0.019		0.109
18	0.516	70	0.034		0.027		0.066
19	0.573	71	0.039		0.026		0.067
20	0.085	52	0.032		0.000		0.379
21	0.570	57	0.073		0.021		0.127
22	0.508	66	0.078		0.023		0.153
23	0.546	70	0.036		0.024		0.065
24	0.426	66	0.067		0.017		0.157
25	0.449	64	0.041		0.019		0.091
26	0.288	61	0.030		0.002		0.103
27	0.372	64	0.020		0.025		0.053
28	0.437	69	0.059		0.021		0.135
29	0.498	71	0.038		0.028		0.076
30	0.507	72	0.044		0.023		0.087
31	0.438	67	0.038		0.018		0.086
SUM	14.738	-	1.311	N.A.	0.550	N.A.	-
AVG	0.475	63	0.042	N.A.	0.018	N.A.	0.089
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY,1979

SOLAR/1008-79/05

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.454	0.024	0.011	75	0.024
2	0.491	0.036	0.029	73	0.059
3	0.347	0.018	0.008	58	0.023
4	0.586	0.047	0.053	73	0.090
5	0.496	0.024	0.030	*	0.060
6	0.627	0.008	0.012	86	0.019
7	0.607	0.000	0.000	81	0.000
8	0.525	0.000	0.000	77	0.000
9	0.297	0.187	0.044	50	0.149
10	0.480	0.330	0.107	57	0.223
11	0.556	0.490	0.164	65	0.294
12	0.608	0.529	0.161	71	0.265
13	0.600	0.498	0.155	78	0.258
14	0.597	0.501	0.152	87	0.255
15	0.336	0.201	0.036	80	0.106
16	0.458	0.349	0.111	84	0.242
17	0.461	0.280	0.072	77	0.157
18	0.516	0.386	0.093	84	0.181
19	0.573	0.455	0.139	85	0.243
20	0.085	0.000	0.000	57	0.000
21	0.570	0.395	0.125	68	0.219
22	0.508	0.385	0.122	81	0.239
23	0.546	0.430	0.133	84	0.244
24	0.426	0.325	0.102	75	0.239
25	0.449	0.326	0.088	78	0.195
26	0.288	0.040	0.009	67	0.030
27	0.372	0.254	0.039	74	0.104
28	0.437	0.311	0.091	81	0.208
29	0.498	0.411	0.108	83	0.217
30	0.507	0.410	0.124	84	0.244
31	0.438	0.300	0.087	81	0.199
SUM	14.738	7.951	2.402	-	-
AVG	0.475	0.256	0.077	75	0.163
NBSID	Q001		Q10C		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY,1979

SOLAR/1008-79/05

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.007	0.058	-0.043	132	2.121
2	0.010	0.050	-0.009	129	4.093
3	-0.000	0.050	-0.063	124	32.480
4	0.022	0.041	-0.014	119	1.203
5	0.008	0.018	-0.003	117	1.821
6	0.008	0.022	-0.003	117	2.461
7	0.000	0.020	-0.035	115	1.000
8	0.000	0.021	-0.031	110	1.000
9	0.028	0.023	-0.016	107	0.220
10	0.128	0.063	0.006	108	0.537
11	0.204	0.053	0.079	112	0.648
12	0.204	0.050	0.078	123	0.628
13	0.190	0.027	0.085	133	0.592
14	0.184	0.053	0.053	143	0.575
15	0.051	0.030	-0.047	143	-0.337
16	0.131	0.033	0.024	142	0.440
17	0.089	0.050	-0.024	140	0.291
18	0.109	0.034	0.003	140	0.333
19	0.161	0.039	0.048	143	0.541
20	0.000	0.032	-0.081	141	1.000
21	0.146	0.073	0.013	136	0.586
22	0.132	0.078	0.001	138	0.592
23	0.157	0.036	0.038	140	0.468
24	0.105	0.067	-0.018	141	0.465
25	0.107	0.041	0.003	140	0.407
26	0.010	0.030	-0.067	136	-3.801
27	0.050	0.020	-0.025	130	-0.093
28	0.113	0.059	0.000	128	0.521
29	0.134	0.038	0.035	131	0.547
30	0.149	0.044	0.032	135	0.511
31	0.106	0.038	-0.002	137	0.339
SUM	2.741	1.288	0.014	-	-
AVG	0.088	0.042	0.000	130	0.475
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY,1979

SOLAR/1008-79/05

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.046	96	0.058	0.008	0.000	0.000	N	0.035	N	67	116	124
2	0.040	100	0.050	0.008	0.000	0.000	O	0.037	O	69	108	119
3	0.041	100	0.050	0.008	0.000	0.000	T	0.031	T	69	109	117
4	0.056	55	0.041	0.007	0.039	0.039		0.026		70	107	120
5	0.026	45	0.018	0.008	0.018	0.018	A	0.007	A	69	131	50
6	0.051	60	0.022	0.008	0.036	0.036	P	0.016	P	69	129	102
7	0.035	49	0.020	0.008	0.021	0.021	P	0.013	P	70	131	68
8	0.054	46	0.021	0.008	0.037	0.037	L	0.017	L	71	128	108
9	0.033	38	0.017	0.008	0.027	0.027	I	0.007	I	70	132	64
10	0.079	42	0.028	0.008	0.058	0.058	C	0.024	C	69	136	152
11	0.008	33	0.009	0.008	0.008	0.008	A	-0.002	A	69	133	16
12	0.081	55	0.050	0.008	0.042	0.042	B	0.041	B	68	130	155
13	0.029	63	0.027	0.008	0.015	0.015	L	0.012	L	69	128	57
14	0.046	77	0.053	0.008	0.009	0.009	E	0.033	E	71	125	93
15	0.020	85	0.030	0.008	0.004	0.004		0.014		69	129	42
16	0.032	73	0.033	0.008	0.012	0.012		0.017		70	127	62
17	0.060	58	0.050	0.008	0.024	0.024		0.035		69	128	125
18	0.027	75	0.034	0.008	0.005	0.005		0.020		70	126	58
19	0.024	86	0.039	0.008	0.009	0.009		0.014		71	130	48
20	0.032	77	0.032	0.008	0.010	0.010		0.018		71	129	67
21	0.031	66	0.043	0.007	0.014	0.014		0.018		71	127	66
22	0.086	69	0.078	0.008	0.031	0.031		0.053		71	129	176
23	0.034	81	0.036	0.008	0.012	0.012		0.019		73	127	72
24	0.071	76	0.067	0.008	0.017	0.017		0.051		71	130	148
25	0.032	84	0.041	0.008	0.008	0.008		0.021		72	126	69
26	0.033	65	0.030	0.008	0.015	0.015		0.017		72	129	70
27	0.025	68	0.020	0.008	0.011	0.011		0.012		73	128	52
28	0.084	59	0.059	0.008	0.037	0.037		0.048		73	130	180
29	0.040	64	0.038	0.008	0.016	0.016		0.024		73	130	82
30	0.053	64	0.044	0.008	0.018	0.018		0.033		71	131	110
31	0.039	73	0.038	0.008	0.013	0.013		0.026		71	127	86
SUM	1.348	-	1.174	0.235	0.567	0.567	N.A.	0.740	N.A.	-	-	2860
AVG	0.043	66	0.038	0.008	0.018	0.018	N.A.	0.024	N.A.	70	127	92
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
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N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY,1979

SOLAR/1008-79/05

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	0.000	0.000	0.000	N	0.000	N	77	63
2	0.000	0	0.000	0.000	0.000	0.000	O	0.000	O	77	61
3	0.000	0	0.000	0.000	0.000	0.000	T	0.000	T	75	53
4	0.000	0	0.000	0.000	0.000	0.000		0.000		75	60
5	0.000	0	0.000	0.000	0.000	0.000	A	0.000	A	76	64
6	0.000	0	0.000	0.000	0.000	0.000	P	0.000	P	77	72
7	0.000	0	0.000	0.000	0.000	0.000	P	0.000	P	77	69
8	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	78	62
9	0.071	40	0.028	0.005	0.012	0.017	I	0.013	I	75	47
10	0.037	92	0.034	0.005	0.001	0.001	C	0.016	C	72	50
11	0.073	60	0.044	0.011	0.008	0.011	A	0.020	A	73	52
12	0.000	0	0.000	0.000	0.000	0.000	B	0.000	B	75	58
13	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	76	60
14	0.000	0	0.000	0.000	0.000	0.000	E	0.000	E	77	65
15	0.000	0	0.000	0.000	0.000	0.000		0.000		78	62
16	0.000	0	0.000	0.000	0.000	0.000		0.000		79	66
17	0.000	0	0.000	0.000	0.000	0.000		0.000		77	67
18	0.000	0	0.000	0.000	0.000	0.000		0.000		77	70
19	0.000	0	0.000	0.000	0.000	0.000		0.000		77	71
20	0.000	0	0.000	0.000	0.000	0.000		0.000		77	52
21	0.030	100	0.030	0.002	0.000	0.000		0.014		76	57
22	0.000	0	0.000	0.000	0.000	0.000		0.000		77	66
23	0.000	0	0.000	0.000	0.000	0.000		0.000		78	70
24	0.000	0	0.000	0.000	0.000	0.000		0.000		79	66
25	0.000	0	0.000	0.000	0.000	0.000		0.000		80	64
26	0.000	0	0.000	0.000	0.000	0.000		0.000		78	61
27	0.000	0	0.000	0.000	0.000	0.000		0.000		78	64
28	0.000	0	0.000	0.000	0.000	0.000		0.000		79	69
29	0.000	0	0.000	0.000	0.000	0.000		0.000		79	71
30	0.000	0	0.000	0.000	0.000	0.000		0.000		79	72
31	0.000	0	0.000	0.000	0.000	0.000		0.000		79	67
SUM	0.212	-	0.136	0.024	0.021	0.029	N.A.	0.063	N.A.	-	-
AVG.	0.007	64	0.004	0.001	0.001	0.001	N.A.	0.002	N.A.	77	63
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: HOMES BY MARILYN
REPORT PERIOD: MAY, 1979

SOLAR/1008-79/05

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1466	N	63	75	N	N	N
2	1585	O	61	73	O	O	O
3	1118	T	53	58	T	T	T
4	1890		60	73			
5	1599	A	64	*	A	A	A
6	2022	P	72	86	P	P	P
7	1958	P	69	81	P	P	P
8	1694	L	62	77	L	L	L
9	960	I	47	50	I	I	I
10	1547	C	50	57	C	C	C
11	1794	A	52	65	A	A	A
12	1960	B	58	71	B	B	B
13	1935	L	60	78	L	L	L
14	1926	E	65	87	E	E	E
15	1084		62	80			
16	1478		66	84			
17	1487		67	77			
18	1663		70	84			
19	1849		71	85			
20	275		52	57			
21	1839		57	68			
22	1639		66	81			
23	1762		70	84			
24	1375		66	75			
25	1449		64	78			
26	927		61	67			
27	1200		64	74			
28	1410		69	81			
29	1605		71	83			
30	1634		72	84			
31	1412		67	81			
SUM	47542	N.A.	-	-	-	-	-
AVG	1534	N.A.	63	75	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

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